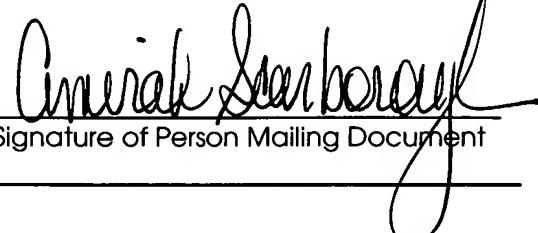


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**Pivoted Device and Portable Computer**

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**BACKGROUND of the INVENTION**

The present invention relates to a pivoted device and portable computer, comprising a pivot member that acts as a pivot allowing its orientation to be changed when it is tilted a predetermined amount by lifting its end.

A portable computer such as a note PC generally has rubber pads in the bottom face to prevent slipping and absorb shock. When using the note PC on a desk, it is sometimes desired to move it on the top of the desk. In such a case, it is necessary to lift the entire note PC while moving it so that the rubber pads do not rub the top of the desk. This operation requires some labor and the note PC may be given a shock when it is again placed on the top of the desk.

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In the prior art, a technology is known in which rollers are provided in the bottom face of a device such as a note PC so that the device can be easily translated on the top of a desk, for example. In this technology, only the rollers come into contact with the top of the desk when the front portion of the device is lifted so that the  
5 device can be moved with the rotating rollers (see Patent documents 1 and 2, for example).

In addition, a technology is also known in which a note PC or the like is mounted on a support having three or four rotatable balls in its lower face so that the note PC can be smoothly moved on a placement plane (see Patent document 3, for  
10 example). Further, a technology is also known in which casters are provided to a heavy rear projector or the like to move it with a slight force. In transit, the rear projector is tilted by pulling a carriage handle and only the casters come into contact with the floor face so that the rear projector can be moved with the rotating casters (see Patent document 4, for example).

15 [Patent document 1]

Published Unexamined Patent Application No. 2000-181576

[Patent document 2]

Published Unexamined Patent Application No. 5-75274

[Patent document 3]

20 Published Unexamined Patent Application No. 2001-175357

[Patent document 4]

Published Unexamined Patent Application No. 2002-296678

However, these prior art technologies are not suitable for the application of changing

the orientation of a device since they use rotators such as rollers and casters exclusively for the purpose of translating the device. This is because when the device is turned by lifting its end to change the orientation of it, the device does not stay in any fixed position due to the rotating rotators and so an extra force is needed

5      to control the position of the device.

In addition, such prior art technologies involve a complex mechanism for supporting rotators such as rollers and casters, increasing the cost of the device. In addition, the prior art technologies are disadvantageous in terms of space saving when they are applied to a portable device requiring compactness since the mechanism for

10     supporting the rotators must be provided in the limited space within the device.

A purpose of the invention is to provide a new technology of allowing the orientation of a device such as a note PC to be easily changed in a convenient configuration.

## SUMMARY of the INVENTION

To achieve this object, a pivoted device according to the present invention comprises a pivot member for supporting the device on a placement plane when the device is placed on the placement plane, wherein the pivot member acts as a pivot

5 that allows the orientation of the device to be changed when the device is tilted by lifting its predetermined end.

An exemplary device may be a mobile personal computer or desktop personal computer, for example. An exemplary placement plane may be the top of a desk or counter, for example. An exemplary predetermined end may be the front end of the

10 device, or the left or right portion of the front end, for example. A pivot member used may be one that has a spherical-shaped portion that comes into contact with the placement plane, for example. The lower end of the pivot member may or may not come into contact with the placement plane when the device is placed on the placement plane.

15 In this configuration, the pivot member can act as a pivot that supports the device when the device is tilted by lifting its predetermined end by hand, allowing the orientation of the device to be changed. The weight of the device is then borne by the hand lifting the end of the device and the pivot member. Then, the lifted end is rotated about the pivot by hand so that the device is turned in a horizontal plane.

20 When the device finds its desired orientation, the lifted end is lowered so that the device is again placed on the placement plane, thus allowing the orientation of the device to be changed.

Thus, the orientation of the device can be easily changed by rotating the device by one hand since about half the weight of the device is borne by the pivot member

25 while the orientation of the device is being changed. In addition, neither movable

part nor complex mechanism is needed since the pivot member is only required to act as a pivot. Therefore, there is no space limitation of the device, increased manufacturing cost, or added manufacturing process.

According to a preferred aspect of the present invention, the device comprises three 5 or more rubber pads for supporting the device on a placement plane when the device is placed on the placement plane. When the device is tilted by lifting its predetermined end, the device is turned on predetermined two of the rubber pads acting as supporting axes until the pivot member comes into contact with the placement plane. The pivot member is positioned outside the supporting axes.

10 That is, first the device is turned on the two rubber pads acting as supporting axes when the end of the device is lifted and then the device is tilted. While the device is tilted a predetermined amount, the pivot members come into contact with the placement plane and act as supporting points. Thus, the pivot members can act as pivots.

15 In addition, the number of the pivot members is not limited to one and may be two or more. In that case, a different pivot member acts as a pivot depending on the position of the end lifted by hand. That is, when one end is lifted, the pivot member on the opposite side to the lifted end with respect to substantially the center of gravity of the device supports the device and so the pivot member acts as a pivot.

20 In addition, the pivot member may be formed integrally with a member constituting the base of the device, for example. In that case, there is substantially no increased manufacturing process or manufacturing cost. On the portion of the pivot member that comes into contact with the placement plane, a coating or cover member of a predetermined material may be provided. The predetermined material used may be 25 a slippery one such as nylon, for example.

When the present invention is applied to a portable computer as a device, the portable computer used may be, for example, one that comprises a body having a keyboard on its top face and various connectors on its back face, a lid portion having a display, the lid portion provided to the body via a hinge so as to open and

5 close with the display face side of the display facing the keyboard, and rubber pads provided at the four corners on the bottom face of the body. In this case, a pivot member may be provided on the bottom face of the body further toward the back face side than the two rubber pads on the back face side of the body. The pivot member serves as a pivot that allows the orientation of the portable computer to be  
10 changed by coming into contact with the placement plane when the front end portion of the body placed on the placement plane is lifted.

In this case, two pivot members, for example, may be provided in right and left positions apart from each other, respectively. In this case, the right pivot member acts as a pivot when the front left end of the body is lifted and the left pivot member  
15 acts as the pivot when the front right end of the body is lifted.

In addition, preferably, the positions of the two rubber pads on the back face side of the body are near enough to the back face of the body that the front end of the body does not rise even when a force is applied to the lid portion to open it, and the positions of the pivot members are apart enough from the two rubber pads on the

20 back face side of the body toward the back face of the body depending on the heights of the lower ends of the pivot members that the lower end of the pivot member comes into contact with the placement plane when the front end portion of the body is lifted.

**BRIEF DESCRIPTION of the DRAWINGS**

Some of the purposes of the invention having been stated, others will appear as the description proceeds, when taken in connection with the accompanying drawings, in which:

5 Figures 1A and 1B are left and right side views of a note PC according to one embodiment of the present invention, respectively;

Figure 2 is a rear view of the note PC in Figure 1;

Figure 3 is a bottom view of the note PC in Figure 1;

10 Figure 4 is a right side view illustrating the note PC as placed on the placement plane P in Figure 1; and

Figures 5A and 5B are right side and bottom views illustrating a note PC according to another embodiment of the present invention, respectively.

## DETAILED DESCRIPTION of the ILLUSTRATIVE EMBODIMENTS

While the present invention will be described more fully hereinafter with reference to the accompanying drawings, in which a preferred embodiment of the present invention is shown, it is to be understood at the outset of the description which

- 5 follows that persons of skill in the appropriate arts may modify the invention here described while still achieving the favorable results of this invention. Accordingly, the description which follows is to be understood as being a broad, teaching disclosure directed to persons of skill in the appropriate arts, and not as limiting upon the present invention.
- 10 Referring now more particularly to the accompanying drawings, Figure 1 shows a side view of a note PC according to one embodiment of the present invention. Figures 1A and 1B show left and right side views of the note PC, respectively. Figure 2 shows a rear view of the note PC in Figure 1 and Figure 3 shows a bottom view of the note PC in Figure 1. As shown in these figures, the note PC comprises a body 1 having a keyboard or the like on its top face, a lid portion 2 provided with a display, the lid portion provided to the body 1 via a hinge so as to open and close with the display face side of the display facing the keyboard, and rubber pads 3a and 3b provided at the four corners on the bottom face of the body 1.
- 15
- 20 The two rubber pads 3a are provided on the front end side of the body 1 and the other two rubber pads 3b are provided on the back face side of the body 1. A pivot member 4 is provided on the bottom face of the body 1 further toward the back face side than the two rubber pads 3b on the back face side. In Figure 1, the front end portion of the note PC is shown as lifted from a placement plane P. The pivot member 4 is then into contact with the placement plane P and acts as a pivot (rotation axis), making it easy to change the orientation of the note PC.
- 25

As shown in Figure 1A, on the left side face of the note PC is provided a hard disk cover 6, a headphone jack 7, a microphone jack 8, a floppy disk unit 9, and a USB port 10 for providing connection to a USB compatible device. On the right side face of the note PC is provided a PC card slot 11 into which a PC card is inserted and an  
5 optical drive 12 such as a CD-ROM drive, as shown in Figure 1B.

As shown in Figure 2, on the back face side of the note PC is provided a CRT port 13 for providing connection to an external CRT monitor, a parallel port 14 for providing connection to a printer or the like, a PC/2 port 15 to which a mouse is connected, a USB port 16 for providing connection to a USB compatible device, a  
10 RJ45 connector 17 for providing connection to a LAN or the like, a RJ11 connector 18 for connection to a telephone line or the like, and a DC input terminal 19.

As shown in Figure 3, on the bottom face of the note PC is provided a battery housing portion 21 and a DIMM (Dual In-line Memory Module) housing portion 22. Reference numeral 20 denotes a fan unit.

15 The battery used is of a large type and the total weight of the note PC including the battery is on the order of 3 to 4 kg. The battery housing portion 21 is provided on the bottom face side of the front portion of the body 1. The positions of the rubber pads 3b on the back face side of the body are near enough to the back face of the body 1 that the front end of the body 1 does not rise even when a force is applied to  
20 the lid portion 2 to open it. That is, the positions of the rubber pads 3b and the weight distribution of the entire PC are such that the front portion of the body 1 does not rise even when only the lid portion 2 is opened by lifting it.

Figure 4 is a right side view illustrating the note PC as placed on the placement plane P. As shown in Figure 4, the pivot member 4 is positioned further toward the  
25 back face side than the rubber pads 3b and provided such that the lower end of the

pivot member 4 does not come into contact with the placement plane P when note PC is placed on it. In addition, the position of the pivot member 4 is apart enough from the rubber pads 3b on the back face side toward the back face of the body 1 depending on the heights of the lower ends of the pivot members that the lower end 5 of the pivot member surely comes into contact with the placement plane P and serves as a pivot when the front end portion of the body 1 is lifted a certain amount. The pivot member 4 is formed integrally with a member constituting the base of the body 1 and has an outer shape as a part of a sphere.

In this configuration, when the orientation of the note PC is desired to be changed 10 while the note PC is used with the lid portion 2 opened, the front portion of the body 1 is first lifted slightly by one hand. Then, the note PC is first turned on the two rubber pads 3b on the back face side acting as supporting axes and is tilted with respect to the placement plane so that the two rubber pads 3a on the front end side leave the placement plane. When the front portion of the body 1 is further lifted, the 15 lower end of the pivot member 4 comes into contact with the placement plane. The note PC is then tilted on the contact point acting as a supporting point and the rubber pads 3b leave the placement plane. Then, only the spherical surface at the lower end of the pivot member 4 comes into contact with the placement plane, allowing the pivot member 4 to act as a pivot.

20 Then, the hand lifting the front portion of the body 1 is moved to a desired direction so that the front portion of the body 1 rotates about the pivot. The note PC is correspondingly turned about the pivot in a horizontal plane. When the note PC is turned to a desired position, the hand is slowly lowered. Thereby, the rubber pads 3b again come into contact with the placement plane and the pivot member 4 leaves 25 the placement plane. By further lowering the hand, the rubber pads 3a on the front end side come into contact with the placement plane. Thus, the note PC is again supported by the rubber pads 3a and 3b on the placement plane, completing the

changing of the orientation of the note PC. During this operation, the balance of the note PC is easily maintained by the hands of the operator when the pivot member 4 acts as a pivot.

Thus, according to this embodiment, the orientation of a note PC can be easily

5 changed by one hand. A possible situation where the orientation of a note PC needs to be changed may be such that in the business talk of financing in a financial institution, for example, the clerk operates the note PC and presents data such as graphs displayed on the display to a customer when the clerk gives explanations for the customer. In such a case, the clerk must lift the entire PC by both hands and  
10 then turn by both hands if the note PC has a certain degree of weight. This operation requires considerable labor. According to this embodiment, the orientation of the note PC can be quickly changed to the customer by one hand. In addition, it is convenient that the orientation of the display can be easily changed when viewing the display from various directions.

15 In addition, various connectors are provided on the back face of the note PC, as described above. When an operator makes connections to these connectors, the operator need not stand up and look in the back face of the note PC from above if the back face is turned to the operator, making it easy to perform operation. Again,

according to this embodiment, the operator can easily perform connection operation  
20 since the orientation of the note PC can be very easily changed.

In addition, the pivot member 4 may be formed integrally with the base of the body 1 and requires no complex mechanism. Therefore, the pivot member 4 can be

provided without the need of increasing cost or adding processes. In addition, there is no space limitation for a planer board and a cooling unit inside the note PC and

25 no volume limitation for the note PC requiring compactness since no complex mechanism is required and therefore no space is needed for incorporating such a mechanism.

Figure 5 illustrates a note PC according to another embodiment of the present invention. Figures 5A and 5B are right side and bottom views, respectively. This embodiment differs from the above-described embodiment only in the number, position and shape of a pivot member. In this embodiment, two pivot members 31a and 31b are provided in right and left positions apart from each other, respectively. The pivot members 31a and 31b are positioned further toward the back face side than the pivot member 4 according to the embodiment shown in Figure 1. The pivot members 31a and 31b have a plate-like shape extending along the back face of the body 1 and the portions of the pivot member 31a and 31b that come into contact with a placement plane have a shape like a capsule that is longitudinally halved. The right pivot member 31a acts as a pivot when the front left end 32a of the body 1 is lifted and the left pivot member 31b acts as the pivot when the front right end 32b of the body 1 is lifted.

Also in this embodiment, the orientation of a note PC can be easily changed by one hand, as in the embodiment in Figure 1. In addition, this embodiment has the advantage that a small amount of movement of the hand on the customer side is needed when the display contents are presented to the customer since the note PC is turned by lifting the front left or right end of the body 1.

The present invention is not limited to the above-described embodiments and modifications may be made thereto as appropriate. For example, in the above description, there is nothing particular on the portion of the pivot member 4 that comes into contact with the placement plane. But instead, a coating of slippery material may be applied to or a cover member of nylon or the like may be provided on that portion.

In addition, in the above description, the pivot member does not come into contact with the placement plane when the device is placed on it and comes into contact with the placement plane and acts as a pivot when the body is tilted. But instead,

the pivot member may come into contact with the placement plane or support the body before the body is tilted. For example, the device may have two rubber pads and a pivot member, which support the body when the device is placed on the placement plane, and when the body is tilted, the rubber pads leave the placement plane and only the pivot member supports the body on the placement plane.

5

As described above, according to the present invention, there is provided a pivot member that acts as a pivot allowing the orientation of the device to be changed when the device is tilted by lifting its end. Thus, the orientation of the device can be easily changed by one hand.

10 In the drawings and specifications there has been set forth a preferred embodiment of the invention and, although specific terms are used, the description thus given uses terminology in a generic and descriptive sense only and not for purposes of limitation.